pierce the glass when the knobs are about one inch apart. H. W. EATON.

GEOLOGY AND MINERALOGY OF NORTHERN CANADA.[1]

BY northern Canada, the author meant the whole of the Dominion northward of the organized provinces and districts, as far as known. His information was derived from his own observations around Hudson's Bay and in the North-west territories, and from the reports and maps of the scientific men who had accompanied the various arctic expeditions by land and sea. Specimens and interesting notes on the geology of Great Slave Lake had been received from Capt. H. P. Dawson, R.A., who had spent last year there, in charge of the Canadian station of the circumpolar commission. The distribution of the various formations, from the oldest to the newest, was illustrated by a large, geologically colored map of the whole Dominion. Referring to the Laurentian system, Professor Bell showed that it forms the surface-rock over an enormous circular area on the main continent, and that the central part of it is occupied by Hudson's Bay, with a border of paleozoic rocks around it. Laurentian rocks are largely developed in Greenland, and along the Atlantic coast from Newfoundland to Georgia. Taken together, the general outline of the Laurentian areas of North America has a form corresponding with that of the whole continent, which has been built around these ancient rocks. The Huronian strata which constitute the principal metalliferous series in Canada were closely associated with the Laurentian, and appeared to be always conformable with them. The largest and best-known areas were between Lake Huron and James's Bay; but Dr. Bell had found four belts of them on the east coast of Hudson's Bay, and others had been recognized in the primitive region to the west of it. Indeed, wherever the older crystalline rocks had been explored in Canada, belts or basins having the character of the Huronian series had been met with. Limestones, slates, and quartzites, interstratified with amygdaloids, basalts, etc., corresponding with the Nipigon formation of Lakes Superior and Nipigon, were largely developed on the Eastmain coast and adjacent islands of Hudson's Bay, and apparently, also, on the Coppermine River, and to the westward of it. But a set of hard red siliceous conglomerates and sandstones were seen to come between the Huronian and the Nipigon series at Richmond Gulf on the Eastmain coast, which appeared to be unconformable to both. Mr. Cochrane and Dr. Bell had found similar rocks on Athabasca Lake; Capt. Dawson, on Great Slave Lake; and Sir John Richardson, to the north-east of Great Bear Lake. The conglomerates, slates, and gray argillaceous quartzites of Churchill, and the white fine-grained quartzite of Marble Island, were probably of this horizon. Silurian rocks were well known to be widely spread on some of the largest of the arctic islands, and along the most northern channels of the Polar Sea. They formed an irregular and interrupted border on the western sides of Hudson's and James's Bays. A large basin of Devonian strata containing gypsum and clay-ironstone extended south-westward from James's Bay. West of the great Laurentian area, Devonian rocks could be traced here and there, all the way from Minnesota to the mouth of the Mackenzie River. They were not, however, so widely distributed as had been supposed by the older travellers who had passed rapidly through the country in the early part of the century, when the whole subject of American geology was in its infancy. The so-called bituminous shales of Sir John Richardson and others, which are so prevalent along the Athabasca and Mackenzie Rivers, were found by Professor Bell to consist of soft cretaceous strata, which had been saturated and blackened by the petroleum rising out of the underlying Devonian rocks, which here, as in Ontario, Ohio, and Pennsylvania, are rich in this substance. The principal features and the geographical distribution of the carboniferous, liassic, cretaceous, and tertiary rocks of the northern regions were successively described. Among other points of interest in reference to the post-tertiary period, Dr. Bell mentioned that the remains of both the mastodon and the mammoth had been found on Hudson's Bay, and that elephants' tusks were reported to occur on an island in its northern part. Isolated discoveries of elephantine remains had been made in the North-west territories, and several on the Rat River, a tributary of the Yukon, near the borders of Alaska.

In referring to the economic minerals, Professor Bell said that even the coarser ones, such as granite, limestone, cement-stone, slate, flagstone, gypsum, clays, marls, ochres, sand for glass-making, etc., would yet have their value in different parts of the great region

[1] Abstract of a paper on the geology and economic minerals of Hudson's Bay and northern Canada, read to the Royal society of Canada, May 23, by Dr. ROBERT BELL.

under consideration. Soapstone, mica, plumbago, asbestos, chromic iron, phosphate of lime, salt, pyrites, etc., had been noted in different localities. Among ornamental stones known to occur, might be mentioned the rare and beautiful mineral lazulite; also malachite, jade, agate, carnelian, chrysoprase, and others. Extensive beds of lignite were found in many places in the great tract of country occupied by the cretaceous and tertiary rocks in the Athabasca-Mackenzie valley and on the coasts and islands of the Arctic Sea; also in tertiary strata at Cumberland Bay, and in Greenland on the opposite side of Davis Strait. On the Moose River were considerable beds of lignite of post-tertiary age. Anthracite of a very pure quality had been found on Long Island in Hudson's Bay. Petroleum rising from the Devonian strata was found through a long stretch of country in the Athabasca-Mackenzie valley. Great quantities of asphalt, resulting from this petroleum, occurred along these rivers and on Great Slave Lake, as well as in various places in the interior. Of the metallic ores, those of iron were very abundant. Inexhaustible quantities of rich manganiferous ironstone exist on the Manitonink Islands, near the east coast of Hudson's Bay. The bedded ore formed the surface over hundreds of square miles, and it was broken up by the frost into pieces of a convenient size for shipping. Valuable deposits of magnetic iron had been found on Athabasca and Knee Lakes, and a thick bed of fine clay-ironstone on the Mattagami River. Capt. Dawson, R.A., had found a vein of crystalline specular iron on Great Slave Lake. Copper ore had been discovered on Hudson's Bay; and the native metal was known to occur in quantities on the Coppermine River, in rocks like those with which it is associated on Lake Superior. Galena was abundant in limestone from Little Whale River to Richmond Gulf, on the Eastmain coast. Zinc, molybdenum, and manganese had also been found on this coast, and antimony in the north. Gold and silver had likewise been detected in veins on the east coast; and alluvial gold had been washed out of the gravel and sand of different streams in the mountainous region west of the lower part of the Mackenzie River. For various reasons, Dr. Bell regarded this region as a highly promising one for the precious metals. The belt of auriferous drift, which crosses the North Saskatchewan at Edmonton, and from which the gold-dust is there washed, may have been brought from this region by ancient glaciers from the valleys of the upper branches of the Liard and Peace Rivers. A number of years ago, Dr. Bell had originated the theory that this gold might have been derived from Huronian rocks to the north-eastward of Edmonton; but he now thought it quite as likely to have had its source in the direction of Cassiar.

THE SCIENTIFIC ACTIVITY OF THE RUSSIAN UNIVERSITIES DURING THE LAST TWENTY-FIVE YEARS.[1]

No endeavor has as yet been made to properly estimate the scientific activity of our universities during the last quarter of a century; and this, I believe, mainly accounts for the sweeping condemnations which make their appearance from time to time, to the effect that our universities are declining, and that the high tide of their scientific activity was long ago passed. Submitting to the judgment of the reader a first feeble attempt of this kind with respect to the development of natural science, including the principles of medicine, I wish expressly to state that the material at my command, while not embracing all accomplished by the universities in the direction of natural science, nevertheless includes every thing essential to point out and prove the most prominent features of the results attained. This, indeed, is the object of the present article. My review excludes the universities at Dorpat and Helsingfors, as they, by their whole constitution, always distinguished themselves from their purely Russian brethren: it also fails to take into account the scientific activity of those members of our academy who are not connected with any Russian university. The material for this sketch has been brought together, not by myself, but by specialists in their respective branches of knowledge, — in physics, by Professor Petrushèfsky; in chemistry, by Professor Menshùtkin; in botany, by Professors Bekètoff, Borodìn, and Gobi; in zoölogy, by Professor Bogdànoff; in geology, by Professor Inostràntseff; in anatomy and physiology, by myself.

If we are to measure the scientific activity of an institution by the degree in which its members participate in the resolution of scientific questions, — and this seems to be the only correct standard, — then the activity of the Russian universities in natural science during the thirty years from 1830 to 1860 cannot be deemed great. Indeed, the number of university professors (with Russian names) engaged in scientific work was small; and these stood almost alone, as it were, hardly exerting any considerable influence over those around them.

There were, of course, many causes for this scarcity and isolation of working-forces; but the principal one, undoubtedly, is to be sought in the general conditions of university life. These conditions logically grew out of the view then accepted as to the object of university-work in regard to the intellectual

[1] Translated and abridged from the Russian of I. SÈCHENOFF, in the *Vestnik Evropy* (European herald) for November, 1883.